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1998 CODATA recommended values of the
fundamental constants of physics and
chemistry / $\hbar c$ values from P.J. Mohr
and B. N. Taylor.

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1998 CODATA RECOMMENDED VALUES OF THE FUNDAMENTAL CONSTANTS OF PHYSICS AND CHEMISTRY

NIST SP 961 (Jan/2001) Values from: P. J. Mohr and B. N. Taylor, J. Phys. Chem. Ref. Data 28, 1713 (1999) and Rev. Mod. Phys. 72, 351 (2000).

A more extensive listing of constants is available in the above references and on the NIST Physics Laboratory Web site physics.nist.gov/constants.

The number in parenthesis is the one-standard-deviation uncertainty in the last two digits of the given value.

| Quantity | Symbol | Numerical value | Unit | Quantity | Symbol | Numerical value | Unit |
|--|--------------------|---|---|---|---------------------------|--|-------------------------|
| speed of light in vacuum | c , c_0 | 299 792 458 (exact) | m s^{-1} | muon g -factor $-2(1 + a_\mu)$ | g_μ | $-2.002\,331\,8320(13)$ | |
| magnetic constant | μ_0 | $4\pi \times 10^{-7}$ (exact) $= 12.566\,370\,614... \times 10^{-7}$ | N A^{-2} N A^{-2} | muon-proton magnetic moment ratio | μ_μ/μ_p | $-3.183\,345\,39(10)$ | |
| electric constant $1/\mu_0 c^2$ | ϵ_0 | $8.854\,187\,817... \times 10^{-12}$ | F m^{-1} | proton mass | m_p | $1.672\,621\,58(13) \times 10^{-27}$ | kg |
| Newtonian constant of gravitation | G | $6.673(10) \times 10^{-11}$ | $\text{m}^3 \text{kg}^{-1} \text{s}^{-2}$ | energy equivalent in MeV | $m_p c^2$ | $938.271\,998(38)$ | MeV |
| Planck constant | h | $6.626\,068\,76(52) \times 10^{-34}$ | J s | proton-electron mass ratio | m_p/m_e | $1\,836.152\,6675(39)$ | |
| in eV s | h | $4.135\,667\,27(16) \times 10^{-15}$ | eV s | proton magnetic moment | μ_p | $1.410\,606\,633(58) \times 10^{-26}$ | J T $^{-1}$ |
| in eV s | $h/2\pi$ | $1.054\,571\,596(82) \times 10^{-34}$ | J s | to nuclear magneton ratio | μ_p/μ_N | $2.792\,847\,337(29)$ | |
| elementary charge | e | $1.602\,176\,462(63) \times 10^{-19}$ | C | proton magnetic shielding correction $1 - \mu_p'/\mu_p$ | σ_p | $25.687(15) \times 10^{-6}$ | |
| magnetic flux quantum $h/2e$ | Φ_0 | $2.067\,833\,636(81) \times 10^{-15}$ | Wb | proton gyromagnetic ratio $2\mu_p/h$ | γ_p | $2.675\,222\,12(11) \times 10^8$ | s $^{-1}$ T $^{-1}$ |
| Josephson constant $2e/h$ | K_J | $483\,597.898(19) \times 10^9$ | Hz V $^{-1}$ | (H $_2$ O, sphere, 25 °C) | $\gamma_p/2\pi$ | $42.577\,4825(18)$ | MHz T $^{-1}$ |
| von Klitzing constant $h/e^2 = \mu_0 c/2a$ | R_K | $25\,812.807\,572(95)$ | Ω | shielded proton gyromagnetic ratio $2\mu_p'/h$ | γ_p' | $2.675\,153\,41(11) \times 10^8$ | s $^{-1}$ T $^{-1}$ |
| Bohr magneton $eh/2m_e$ | μ_B | $927.400\,899(37) \times 10^{-26}$ | J T $^{-1}$ | neutron mass in u | $\gamma_p'/2\pi$ | $42.576\,3888(18)$ | MHz T $^{-1}$ |
| in eV T $^{-1}$ | μ_N | $5.788\,381\,749(43) \times 10^{-5}$ | eV T $^{-1}$ | energy equivalent in MeV | m_n | $1.008\,664\,915\,78(55)$ | u |
| nuclear magneton $eh/2m_p$ | μ_N | $5.050\,783\,17(20) \times 10^{-27}$ | J T $^{-1}$ | neutron-proton mass ratio | $m_n c^2$ | $939.565\,330(38)$ | MeV |
| in eV T $^{-1}$ | μ_N | $3.152\,451\,238(24) \times 10^{-8}$ | eV T $^{-1}$ | neutron magnetic moment | m_n/m_p | $1.001\,378\,418\,87(58)$ | J T $^{-1}$ |
| fine-structure constant $e^2/4\pi\epsilon_0\hbar c$ | α | $7.297\,352\,533(27) \times 10^{-3}$ | | to nuclear magneton ratio | μ_n | $-0.966\,236\,40(23) \times 10^{-26}$ | J T $^{-1}$ |
| inverse fine-structure constant | α^{-1} | $137.035\,999\,76(50)$ | | energy equivalent in MeV | μ_n/μ_N | $-1.913\,042\,72(45)$ | |
| Rydberg constant $\alpha^2 m_e c/2h$ | R_∞ | $10\,973\,731.568\,549(83)$ | m $^{-1}$ | energy equivalent in MeV | m_d | $2.013\,553\,212\,71(35)$ | u |
| Bohr radius $a/4\pi R_\infty = 4\pi\epsilon_0\hbar^2/m_e e^2$ | $R_\infty c$ | $3.289\,841\,960\,368(25) \times 10^{15}$ | Hz | deuteron-proton mass ratio | $m_d c^2$ | $1\,875.612\,762(75)$ | MeV |
| Hartree energy $e^2/4\pi\epsilon_0 a_0 = 2R_\infty \hbar c = \alpha^2 m_e c^2$ | $R_\infty \hbar c$ | $13.605\,691\,72(53)$ | eV | deuteron magnetic moment | m_d/m_p | $1.999\,007\,500\,83(41)$ | J T $^{-1}$ |
| in eV | a_0 | $0.529\,177\,2083(19) \times 10^{-10}$ | m | to nuclear magneton ratio | μ_d | $0.433\,073\,457(18) \times 10^{-26}$ | J T $^{-1}$ |
| electron mass | m_e | $4.359\,743\,81(34) \times 10^{-18}$ | kg | helion (^3He nucleus) mass in u | μ_d/μ_N | $0.857\,438\,2284(94)$ | |
| in u | m_e | $27.211\,3834(11)$ | u | energy equivalent in MeV | m_h | $3.014\,932\,234\,69(86)$ | u |
| energy equivalent in eV | $m_e c^2$ | $5.485\,799\,110(12) \times 10^{-4}$ | MeV | shielded helion magnetic moment | $m_h c^2$ | $2\,808.391\,32(11)$ | MeV |
| electron-muon mass ratio | m_e/m_μ | $4.836\,332\,10(15) \times 10^{-3}$ | | (gas, sphere, 25 °C) | μ_h | $-1.074\,552\,967(45) \times 10^{-26}$ | J T $^{-1}$ |
| electron-proton mass ratio | m_e/m_p | $5.446\,170\,232(12) \times 10^{-4}$ | | to Bohr magneton ratio | μ_h/μ_B | $-1.158\,671\,474(14) \times 10^{-3}$ | |
| electron charge to mass quotient | $-e/m_e$ | $-1.758\,820\,174(71) \times 10^{11}$ | C kg $^{-1}$ | alpha particle mass in u | μ_h/μ_N | $-2.127\,497\,718(25)$ | u |
| Compton wavelength $h/m_e c$ | λ_C | $2.426\,310\,215(18) \times 10^{-12}$ | m | energy equivalent in MeV | $m_\alpha c^2$ | $4.001\,506\,1747(10)$ | MeV |
| $\lambda_C/2\pi = a_0 = \alpha^2/4\pi R_\infty$ | λ_C | $386.159\,2642(28) \times 10^{-15}$ | m | Avogadro constant | N_A, L | $6.022\,141\,99(47) \times 10^{23}$ | mol $^{-1}$ |
| classical electron radius $\alpha^2 a_0$ | r_e | $2.817\,940\,285(31) \times 10^{-15}$ | m | atomic mass constant $\frac{1}{12} m(^{12}\text{C}) = 1\text{ u}$ | m_u | $1.660\,538\,73(13) \times 10^{-27}$ | kg |
| Thomson cross section $(8\pi/3)r_e^2$ | σ_e | $0.665\,245\,854(15) \times 10^{-28}$ | m 2 | energy equivalent in MeV | $m_u c^2$ | $931.494\,013(37)$ | MeV |
| electron magnetic moment | μ_e | $-928.476\,362(37) \times 10^{-26}$ | J T $^{-1}$ | Faraday constant $N_A e$ | F | $96\,485.3415(39)$ | C mol $^{-1}$ |
| to Bohr magneton ratio | μ_e/μ_B | $-1.001\,159\,652\,1869(41)$ | | molar gas constant | R | $8.314\,472(15)$ | J mol $^{-1}$ K $^{-1}$ |
| to nuclear magneton ratio | μ_e/μ_N | $-1\,838.281\,9660(39)$ | | Boltzmann constant R/N_A | k | $1.380\,6503(24) \times 10^{-23}$ | J K $^{-1}$ |
| electron magnetic moment anomaly $ \mu_e /\mu_B - 1$ | a_e | $1.159\,652\,1869(41) \times 10^{-3}$ | | in eV K $^{-1}$ | V_m | $8.617\,342(15) \times 10^{-5}$ | eV K $^{-1}$ |
| electron g -factor $-2(1 + a_e)$ | g_e | $-2.002\,319\,304\,3737(82)$ | | molar volume of ideal gas RT/p | σ | $5.670\,400(40) \times 10^{-8}$ | W m $^{-2}$ K $^{-4}$ |
| electron-proton magnetic moment ratio | μ_e/μ_p | $-658.210\,6875(66)$ | u | Stefan-Boltzmann constant $\pi^2 k^4/60\hbar^3 c^2$ | c_1 | $3.741\,771\,07(29) \times 10^{-16}$ | W m 2 |
| muon mass in u | m_μ | $0.113\,428\,9168(34)$ | u | first radiation constant $2\pi\hbar c^2$ | c_2 | $1.438\,7752(25) \times 10^{-2}$ | m K |
| energy equivalent in MeV | $m_\mu c^2$ | $105.658\,3568(52)$ | MeV | second radiation constant $\hbar c/k$ | b | $2.897\,7686(51) \times 10^{-3}$ | m K |
| muon-electron mass ratio | m_μ/m_e | $206.768\,2657(63)$ | | When displacement law constant | $xu(\text{Cu K}\alpha_1)$ | $1.002\,077\,03(28) \times 10^{-13}$ | m |
| muon magnetic moment | μ_μ | $-4.480\,448\,13(22) \times 10^{-26}$ | J T $^{-1}$ | $b = \lambda_{\text{max}} T = c_2/4.965\,114\,231...$ | $xu(\text{Mo K}\alpha_1)$ | $1.002\,099\,59(53) \times 10^{-13}$ | m |
| to Bohr magneton ratio | μ_μ/μ_B | $-4.841\,970\,85(15) \times 10^{-3}$ | | Cu x unit: $\lambda(\text{Mo K}\alpha_1)/1\,537.400$ | | | |
| to nuclear magneton ratio | μ_μ/μ_N | $-8.890\,597\,70(27)$ | | Mo x unit: $\lambda(\text{Mo K}\alpha_1)/707.831$ | | | |
| muon magnetic moment anomaly $ \mu_\mu /(eh/2m_\mu) - 1$ | a_μ | $1.165\,916\,02(64) \times 10^{-3}$ | | | | | |

Energy equivalents

| | | | | | |
|-------------------|---|-----------------|-----------------|--|-----------------|
| (1 J) | $= 6.241\,509\,74(24) \times 10^{18}$ | eV | (1 eV)/ c^2 | $= 1.073\,544\,206(43) \times 10^{-9}$ | u |
| (1 eV) | $= 1.602\,176\,462(63) \times 10^{-19}$ | J | (1 kg) | $= 6.022\,141\,99(47) \times 10^{26}$ | u |
| (1 eV)/ $\hbar c$ | $= 8.065\,544\,77(32) \times 10^5$ | m ⁻¹ | (1 u) | $= 1.660\,538\,73(13) \times 10^{-27}$ | kg |
| (1 eV)/ \hbar | $= 2.417\,989\,491(95) \times 10^{14}$ | Hz | (1 u) c/\hbar | $= 7.513\,006\,658(57) \times 10^{14}$ | m ⁻¹ |
| (1 eV)/ k | $= 1.160\,4506(20) \times 10^4$ | K | (1 u) c^2 | $= 931.494\,013(37) \times 10^6$ | eV |

1998 CODATA RECOMMENDED VALUES OF THE FUNDAMENTAL PHYSICAL CONSTANTS

NIST SP 961A(Jan/2001) Values from: P. J. Mohr and B. N. Taylor, J. Phys. Chem. Ref. Data 28, 1747-1764 (1999)

A more extensive listing of constants is available in the above references and in the NIST Special Publication 961A. The number in parenthesis is the one-standard-deviation relative uncertainty.

| Quantity | Symbol | Numerical value | Unit |
|---|---------------|---|---|
| speed of light in vacuum | c, c_0 | 299 792 458 (exact) | m s^{-1} |
| magnetic constant | μ_0 | $4\pi \times 10^{-7}$ (exact) $= 12.566 370 614 \dots \times 10^{-7}$ | N A^{-2} N A^{-2} |
| electric constant $1/\mu_0 c^2$ | ϵ_0 | $8.854 187 817 \dots \times 10^{-12}$ | F m^{-1} |
| Newtonian constant of gravitation | G | $6.673(10) \times 10^{-11}$ | $\text{m}^3 \text{kg}^{-1} \text{s}^{-2}$ |
| Planck constant | h | $6.626 068 76(52) \times 10^{-34}$ $4.135 667 27(16) \times 10^{-15}$ | J s eV s |
| in eV s | \hbar | $1.054 571 596(82) \times 10^{-34}$ $6.582 118 89(26) \times 10^{-16}$ | J s eV s |
| $h/2\pi$ | \hbar | $1.054 571 596(82) \times 10^{-34}$ $6.582 118 89(26) \times 10^{-16}$ | J s eV s |
| in eV s | \hbar | $1.054 571 596(82) \times 10^{-34}$ $6.582 118 89(26) \times 10^{-16}$ | J s eV s |
| elementary charge | e | $1.602 176 462(63) \times 10^{-19}$ | C |
| magnetic flux quantum $h/2e$ | Φ_0 | $2.067 833 636(81) \times 10^{-15}$ | Wb |
| Josephson constant $2e/h$ | K_J | $483 597.898(19) \times 10^9$ | Hz V^{-1} |
| von Klitzing constant $h/e^2 = \mu_0 c/2\alpha$ | R_K | $25 812.807 572(95)$ | Ω |
| Bohr magneton $e\hbar/2m_e$ | μ_B | $927.400 899(37) \times 10^{-26}$ $5.788 381 749(43) \times 10^{-5}$ | J T^{-1} eV T^{-1} |
| in eV T ⁻¹ | μ_B | $927.400 899(37) \times 10^{-26}$ $5.788 381 749(43) \times 10^{-5}$ | J T^{-1} eV T^{-1} |
| nuclear magneton $e\hbar/2m_p$ | μ_N | $5.050 783 17(20) \times 10^{-27}$ $3.152 451 238(24) \times 10^{-8}$ | J T^{-1} eV T^{-1} |
| in eV T ⁻¹ | μ_N | $5.050 783 17(20) \times 10^{-27}$ $3.152 451 238(24) \times 10^{-8}$ | J T^{-1} eV T^{-1} |
| fine-structure constant $e^2/4\pi\epsilon_0\hbar c$ | α | $7.297 352 533(27) \times 10^{-3}$ $137.035 999 76(50)$ | |
| inverse fine-structure constant | α^{-1} | $137.035 999 76(50)$ | m^{-1} |
| Rydberg constant $\alpha^2 m_e c/2\hbar$ | R_∞ | $10 973 731.568 549(83)$ | Hz |
| energy equivalent in eV | $R_\infty hc$ | $3.289 841 960 368(25) \times 10^{15}$ $13.605 691 72(53)$ | eV |
| Bohr radius $a_0 = 4\pi\epsilon_0\hbar^2/m_e e^2$ | a_0 | $0.529 177 2083(19) \times 10^{-10}$ | m |
| Hartree energy $e^2/4\pi\epsilon_0 a_0 = 2R_\infty hc = \alpha^2 m_e c^2$ | E_h | $4.359 743 81(34) \times 10^{-18}$ $97 211 3834(11)$ | J eV |

1998 CODATA RECOMMENDED VALUES OF THE FUNDAMENTAL CONSTANTS OF PHYSICS AND CHEMISTRY

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The number in parenthesis is the one-standard-deviation uncertainty in the last two digits of the given value.

| Quantity | Symbol | Numerical value | Unit | Quantity | Symbol | Numerical value | Unit |
|--|--------------------|---|---|--|---------------------------|--|-------------------------------------|
| speed of light in vacuum | c, c_0 | 299 792 458 (exact) | m s^{-1} | muon g -factor $-2(1 + a_\mu)$ | g_μ | $-2.002\,331\,8320(13)$ | |
| magnetic constant | μ_0 | $4\pi \times 10^{-7}$ (exact) | N A^{-2} | muon-proton magnetic moment ratio | μ_μ/μ_p | $-3.183\,345\,39(10)$ | |
| | | $= 12.566\,370\,614\dots \times 10^{-7}$ | N A^{-2} | proton mass | m_p | $1.672\,621\,58(13) \times 10^{-27}$ | kg |
| electric constant $1/\mu_0 c^2$ | ϵ_0 | $8.854\,187\,817\dots \times 10^{-12}$ | F m^{-1} | in u | | $1.007\,276\,466\,88(13)$ | u |
| Newtonian constant of gravitation | G | $6.673(10) \times 10^{-11}$ | $\text{m}^3 \text{kg}^{-1} \text{s}^{-2}$ | energy equivalent in MeV | $m_p c^2$ | $938.271\,998(38)$ | MeV |
| Planck constant | h | $6.626\,068\,76(52) \times 10^{-34}$ | J s | proton-electron mass ratio | m_p/m_e | $1\,836.152\,6675(39)$ | |
| in eV s | | $4.135\,667\,27(16) \times 10^{-15}$ | eV s | proton magnetic moment | μ_p | $1.410\,606\,633(58) \times 10^{-26}$ | J T^{-1} |
| $h/2\pi$ | \hbar | $1.054\,571\,596(82) \times 10^{-34}$ | J s | to nuclear magneton ratio | μ_p/μ_N | $2.792\,847\,337(29)$ | |
| in eV s | | $6.582\,118\,89(26) \times 10^{-16}$ | eV s | proton magnetic shielding correction $1 - \mu'_p/\mu_p$ | σ'_p | $25.687(15) \times 10^{-6}$ | |
| elementary charge | e | $1.602\,176\,462(63) \times 10^{-19}$ | C | (H ₂ O, sphere, 25 °C) | | | |
| magnetic flux quantum $h/2e$ | Φ_0 | $2.067\,833\,636(81) \times 10^{-15}$ | Wb | proton gyromagnetic ratio $2\mu_p/\hbar$ | γ_p | $2.675\,222\,12(14) \times 10^8$ | $\text{s}^{-1} \text{T}^{-1}$ |
| Josephson constant $2e/h$ | K_J | $483\,597.898(19) \times 10^9$ | Hz V ⁻¹ | $\gamma_p/2\pi$ | | $42.577\,4825(18)$ | MHz T ⁻¹ |
| von Klitzing constant $h/e^2 = \mu_0 c/2\alpha$ | R_K | $25\,812.807\,572(95)$ | Ω | shielded proton gyromagnetic ratio $2\mu'_p/\hbar$ | γ'_p | $2.675\,153\,44(11) \times 10^8$ | $\text{s}^{-1} \text{T}^{-1}$ |
| Bohr magneton $eh/2m_e$ | μ_B | $927.400\,899(37) \times 10^{-26}$ | J T ⁻¹ | (H ₂ O, sphere, 25 °C) | | | |
| in eV T ⁻¹ | | $5.788\,381\,749(43) \times 10^{-5}$ | eV T ⁻¹ | | $\gamma'_p/2\pi$ | $42.576\,3888(18)$ | MHz T ⁻¹ |
| nuclear magneton $eh/2m_p$ | μ_N | $5.050\,783\,17(20) \times 10^{-27}$ | J T ⁻¹ | neutron mass in u | m_n | $1.008\,664\,915\,78(55)$ | u |
| in eV T ⁻¹ | | $3.152\,451\,238(24) \times 10^{-8}$ | eV T ⁻¹ | energy equivalent in MeV | $m_n c^2$ | $939.565\,330(38)$ | MeV |
| fine-structure constant $e^2/4\pi\epsilon_0\hbar c$ | α | $7.297\,352\,533(27) \times 10^{-3}$ | | neutron-proton mass ratio | m_n/m_p | $1.001\,378\,418\,87(58)$ | |
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| | $R_\infty c$ | $3.289\,841\,960\,368(25) \times 10^{15}$ | Hz | deuteron mass in u | m_d | $2.013\,553\,212\,71(35)$ | u |
| energy equivalent in eV | $R_\infty \hbar c$ | $13.605\,691\,72(53)$ | eV | energy equivalent in MeV | $m_d c^2$ | $1\,875.612\,762(75)$ | MeV |
| Bohr radius $\alpha/4\pi R_\infty = 4\pi\epsilon_0\hbar^2/m_e e^2$ | a_0 | $0.529\,177\,2083(19) \times 10^{-10}$ | m | deuteron-proton mass ratio | m_d/m_p | $1.999\,007\,500\,83(41)$ | |
| Hartree energy $e^2/4\pi\epsilon_0 a_0 = 2R_\infty \hbar c = \alpha^2 m_e c^2$ | E_h | $4.359\,743\,81(34) \times 10^{-18}$ | J | deuteron magnetic moment | μ_d | $0.433\,073\,457(18) \times 10^{-26}$ | J T ⁻¹ |
| in eV | | $27.211\,3834(11)$ | eV | to nuclear magneton ratio | μ_d/μ_N | $0.857\,438\,2284(94)$ | |
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| in u | | $5.485\,799\,110(12) \times 10^{-4}$ | u | energy equivalent in MeV | $m_h c^2$ | $2\,808.391\,32(11)$ | MeV |
| energy equivalent in MeV | $m_e c^2$ | $0.510\,998\,902(21)$ | MeV | shielded helion magnetic moment | μ'_h | $-1.074\,552\,967(45) \times 10^{-26}$ | J T ⁻¹ |
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| Compton wavelength $h/m_e c$ | λ_C | $2.426\,310\,215(18) \times 10^{-12}$ | m | alpha particle mass in u | m_α | $4.001\,506\,1747(10)$ | u |
| $\lambda_C/2\pi = \alpha a_0 = \alpha^2/4\pi R_\infty$ | λ_C | $386.159\,2642(28) \times 10^{-15}$ | m | energy equivalent in MeV | $m_\alpha c^2$ | $3\,727.379\,04(15)$ | MeV |
| classical electron radius $\alpha^2 a_0$ | r_e | $2.817\,940\,285(31) \times 10^{-15}$ | m | Avogadro constant | N_A, L | $6.022\,141\,99(47) \times 10^{23}$ | mol ⁻¹ |
| Thomson cross section $(8\pi/3)r_e^2$ | σ_e | $0.665\,245\,854(15) \times 10^{-28}$ | m ² | atomic mass constant $\frac{1}{12}m(^{12}\text{C}) = 1 \text{ u}$ | m_u | $1.660\,538\,73(13) \times 10^{-27}$ | kg |
| electron magnetic moment | μ_e | $-928.476\,362(37) \times 10^{-26}$ | J T ⁻¹ | energy equivalent in MeV | $m_u c^2$ | $931.494\,013(37)$ | MeV |
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| to nuclear magneton ratio | μ_e/μ_N | $-1\,838.281\,9660(39)$ | | molar gas constant | R | $8.314\,472(15)$ | J mol ⁻¹ K ⁻¹ |
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| electron g -factor $-2(1 + a_e)$ | g_e | $-2.002\,319\,304\,3737(82)$ | | in eV K ⁻¹ | | $8.617\,342(15) \times 10^{-5}$ | eV K ⁻¹ |
| electron-proton magnetic moment ratio | μ_e/μ_p | $-658.210\,6875(66)$ | | molar volume of ideal gas RT/p | V_m | $22.413\,996(39) \times 10^{-3}$ | m ³ mol ⁻¹ |
| muon mass in u | m_μ | $0.113\,428\,9168(34)$ | u | ($T = 273.15 \text{ K}$, $p = 101.325 \text{ kPa}$) | | | |
| energy equivalent in MeV | $m_\mu c^2$ | $105.658\,3568(52)$ | MeV | Stefan-Boltzmann constant $\pi^2 k^4/60\hbar^3 c^2$ | σ | $5.670\,400(40) \times 10^{-8}$ | W m ⁻² K ⁻⁴ |
| muon-electron mass ratio | m_μ/m_e | $206.768\,2657(63)$ | | first radiation constant $2\pi\hbar c^2$ | c_1 | $3.741\,771\,07(29) \times 10^{-16}$ | W m ² |
| muon magnetic moment | μ_μ | $-4.490\,448\,13(22) \times 10^{-26}$ | J T ⁻¹ | second radiation constant $\hbar c/k$ | c_2 | $1.438\,7752(25) \times 10^{-2}$ | m K |
| to Bohr magneton ratio | μ_μ/μ_B | $-4.841\,970\,85(15) \times 10^{-3}$ | | Wien displacement law constant | | | |
| to nuclear magneton ratio | μ_μ/μ_N | $-8.890\,597\,70(27)$ | | $b = \lambda_{\text{max}} T = c_2/4.965\,114\,231\dots$ | b | $2.897\,7686(51) \times 10^{-3}$ | m K |
| muon magnetic moment anomaly | | | | Cu x unit: $\lambda(\text{Cu K}\alpha_1)/1\,537.400$ | $xu(\text{Cu K}\alpha_1)$ | $1.002\,077\,03(28) \times 10^{-13}$ | m |
| $ \mu_\mu /(e\hbar/2m_\mu) - 1$ | a_μ | $1.165\,916\,02(64) \times 10^{-3}$ | | Mo x unit: $\lambda(\text{Mo K}\alpha_1)/707.831$ | $xu(\text{Mo K}\alpha_1)$ | $1.002\,099\,59(53) \times 10^{-13}$ | m |
| Energy equivalents | | | | | | | |
| $(1 \text{ m}^{-1})c = 299\,792\,458 \text{ Hz}$ | | $(1 \text{ Hz})h/k = 4.799\,2374(84) \times 10^{-11} \text{ K}$ | | $(1 \text{ J}) = 6.241\,509\,74(24) \times 10^{18} \text{ eV}$ | | $(1 \text{ eV})/c^2 = 1.073\,544\,206(43) \times 10^{-9} \text{ u}$ | |
| $(1 \text{ m}^{-1})\hbar c/k = 1.438\,7752(25) \times 10^{-2} \text{ K}$ | | $(1 \text{ Hz})h = 4.135\,667\,27(16) \times 10^{-15} \text{ eV}$ | | $(1 \text{ eV}) = 1.602\,176\,462(63) \times 10^{-19} \text{ J}$ | | $(1 \text{ kg}) = 6.022\,141\,99(47) \times 10^{26} \text{ u}$ | |
| $(1 \text{ m}^{-1})\hbar c = 1.239\,841\,857(49) \times 10^{-6} \text{ eV}$ | | $(1 \text{ K})k/\hbar c = 69.503\,56(12) \text{ m}^{-1}$ | | $(1 \text{ eV})/\hbar c = 8.065\,544\,77(32) \times 10^5 \text{ m}^{-1}$ | | $(1 \text{ u}) = 1.660\,538\,73(13) \times 10^{-27} \text{ kg}$ | |
| $(1 \text{ m}^{-1})h/c = 1.331\,025\,042(10) \times 10^{-15} \text{ u}$ | | $(1 \text{ K})k/h = 2.083\,6644(36) \times 10^{10} \text{ Hz}$ | | $(1 \text{ eV})/h = 2.417\,989\,491(95) \times 10^{14} \text{ Hz}$ | | $(1 \text{ u})c/h = 7.513\,006\,658(57) \times 10^{14} \text{ m}^{-1}$ | |
| $(1 \text{ Hz})/c = 3.335\,640\,952 \times 10^{-9} \text{ m}^{-1}$ | | $(1 \text{ K})k = 8.617\,342(15) \times 10^{-5} \text{ eV}$ | | $(1 \text{ eV})/k = 1.160\,4506(20) \times 10^4 \text{ K}$ | | $(1 \text{ u})c^2 = 931.494\,013(37) \times 10^6 \text{ eV}$ | |

| | | |
|--|-----------------|--|
| in u | | |
| energy equivalent in MeV | $m_e c^2$ | 5.485 799 110(12) $\times 10^{-4}$ u |
| electron-muon mass ratio | m_e/m_μ | 0.510 998 902(21) MeV |
| electron-proton mass ratio | m_e/m_p | 4.836 332 10(15) $\times 10^{-3}$ |
| electron charge to mass quotient | $-e/m_e$ | 5.446 170 232(12) $\times 10^{-4}$ |
| Compton wavelength $h/m_e c$ | λ_C | -1.758 820 174(71) $\times 10^{11}$ C kg ⁻¹ |
| $\lambda_C/2\pi = \alpha a_0 = \alpha^2/4\pi R_\infty$ | λ_C | 2.426 310 215(18) $\times 10^{-12}$ m |
| classical electron radius $\alpha^2 a_0$ | r_e | 386.159 2642(28) $\times 10^{-15}$ m |
| Thomson cross section $(8\pi/3)r_e^2$ | σ_e | 2.817 940 285(31) $\times 10^{-15}$ m ² |
| electron magnetic moment | μ_e | 0.665 245 854(15) $\times 10^{-28}$ J T ⁻¹ |
| to Bohr magneton ratio | μ_e/μ_B | -928.476 362(37) $\times 10^{-26}$ |
| to nuclear magneton ratio | μ_e/μ_N | -1.001 159 652 1869(41) |
| electron magnetic moment anomaly $ \mu_e /\mu_B - 1$ | a_e | -1 838.281 9660(39) |
| electron g -factor $-2(1 + a_e)$ | g_e | 1.159 652 1869(41) $\times 10^{-3}$ |
| electron-proton magnetic moment ratio | μ_e/μ_p | -2.002 319 304 3737(82) |
| muon mass in u | m_μ | -658.210 6875(66) u |
| energy equivalent in MeV | $m_\mu c^2$ | 0.113 428 9168(34) MeV |
| muon-electron mass ratio | m_μ/m_e | 105.658 3568(52) |
| muon magnetic moment | μ_μ | 206.768 2657(63) J T ⁻¹ |
| to Bohr magneton ratio | μ_μ/μ_B | -4.490 448 13(22) $\times 10^{-26}$ |
| to nuclear magneton ratio | μ_μ/μ_N | -4.841 970 85(15) $\times 10^{-3}$ |
| muon magnetic moment anomaly | a_μ | -8.890 597 70(27) |
| $ \mu_\mu /(e\hbar/2m_\mu) - 1$ | | 1.165 916 02(64) $\times 10^{-3}$ |

Energy eq

| | | |
|--------------------------|---|---|
| $(1 \text{ m}^{-1})c$ | $= 299\,792\,458 \text{ Hz}$ | $(1 \text{ Hz})h/k = 4.799\,237\,4(84) \times 10^{-11} \text{ K}$ |
| $(1 \text{ m}^{-1})hc/k$ | $= 1.438\,775\,2(25) \times 10^{-2} \text{ K}$ | $(1 \text{ Hz})h = 4.135\,667\,27(16) \times 10^{-15} \text{ eV}$ |
| $(1 \text{ m}^{-1})hc$ | $= 1.239\,841\,857(49) \times 10^{-6} \text{ eV}$ | $(1 \text{ K})k/hc = 69.503\,56(12) \text{ m}^{-1}$ |
| $(1 \text{ m}^{-1})h/c$ | $= 1.331\,025\,042(10) \times 10^{-15} \text{ u}$ | $(1 \text{ K})k/h = 2.083\,664\,4(36) \times 10^{10} \text{ Hz}$ |
| $(1 \text{ Hz})/c$ | $= 3.335\,640\,952 \times 10^{-9} \text{ m}^{-1}$ | $(1 \text{ K})k = 8.617\,342(15) \times 10^{-5} \text{ eV}$ |

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